Methods for analysis of brain tumor stem cell and neural stem cell self-renewal.

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Public Summary:
Neural stem cells (NSC) self-renew and are multipotent, producing neurons and glia. Recent studies have shown that brain tumors (BT) contain cells that, like NSC, self-renew and are multipotent, producing the different types of cells found within the brain tumors. These brain tumor stem cells are a kind of cancer stem cell, competent to form tumors that mimic the parent tumor in experimental animals. Studies from our laboratory and others have demonstrated that brain tumor stem cells and NSC share similar mechanisms and pathways for proliferation. For example, we have identified that one of the AMPK/snf1 kinases, maternal embryonic leucine zipper kinase (MELK), is highly expressed in NSC and malignant brain tumors, as well as in brain tumor stem cell-enriched cell cultures. Analysis of transgenic MELK-reporter mice indicated that MELK is expressed in NSC in vivo, and our in vitro studies demonstrated that MELK is required for NSC self-renewal. We have also found that MELK is required for proliferation of putative BT stem cells. Utilizing our studies with MELK as an example, this chapter describes methods to culture NSC and BT stem cells, and to analyze the pathways, which regulate self-renewal of those cells.

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